

NAVAL WAR COLLEGE

Newport, Rhode Island

UAVs FOR THE OPERATIONAL COMMANDER

BEYOND TACTICAL RECONNAISSANCE, SURVEILLANCE AND TARGET ACQUISITION (RSTA)

by

Maxie C. Thom
Major, U. S. Air Force

A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

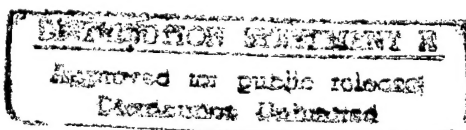
The contents of this paper reflect my own personal views and not necessarily endorsed by the Naval War College or the Department of the Navy.

Signature : Maxie C. Thom

DTIC QUALITY INSPECTED 4

13 June 1997

Paper directed by
Captain George W. Jackson, U.S. Navy
Chairman, Department of Joint Military Operations



[Signature]

Faculty Advisor
Lt Col Robert A. Coe, USAF
Joint Military Operations Department

7 Feb 97
Date

1997 05 20 222

REPORT DOCUMENTATION PAGE

1. Report Security Classification: UNCLASSIFIED			
2. Security Classification Authority:			
3. Declassification/Downgrading Schedule:			
4. Distribution/Availability of Report: DISTRIBUTION STATEMENT A: APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED.			
5. Name of Performing Organization: JOINT MILITARY OPERATIONS DEPARTMENT			
6. Office Symbol: C		7. Address: NAVAL WAR COLLEGE 686 CUSHING ROAD NEWPORT, RI 02841-1207	
8. Title (Include Security Classification): UAVs For The Operational Commander: Beyond Tactical Reconnaissance, Surveillance, and Target Acquisition (RSTA)			
9. Personal Authors: Major Maxie C. Thom, USAF			
10. Type of Report: FINAL		11. Date of Report: 7 Feb 1997	
12. Page Count: 24			
13. Supplementary Notation: A paper submitted to the Faculty of the NWC in partial satisfaction of the requirements of the JMO Department. The contents of this paper reflect my own personal views and are not necessarily endorsed by the NWC or the Department of the Navy.			
14. Ten key words that relate to your paper: Unmanned Aerial Vehicles (UAVs), Operational Fires, Reconnaissance, Surveillance and Target Acquisition (RSTA), Pioneer UAVs, Defense Airborne Reconnaissance Office (DARO), Joint Doctrine, Operational Training, Operational Art, Operational Commander, Joint Force Commander (JFC).			
15. Abstract: Joint Publication 3-55, Doctrine for Reconnaissance, Surveillance, and Target Acquisition (RSTA) and 3-55.1, Joint Tactics, Techniques, and Procedures (JTTP) for Unmanned Aerial Vehicles (UAVs), consider UAVs as tactical assets. As joint publications, they have an obligation to establish a framework to guide the employment of joint forces and provide a basis for joint training to enhance the effectiveness of joint operations. The tactical focus of joint doctrine for UAV employment is echoed in other joint doctrinal publications to include Joint Pub 2-0, Intelligence Support to Joint Operations. This myopic focus inhibits the integration of UAVs into sequenced and synchronized joint operations, thereby, limiting their ability to conduct operations at the operational and strategic levels of war. Current UAV doctrine must be changed in order for commanders to realize the full potential of UAVs to enhance joint operations. Only then can an adequate framework for employment and training be established to allow a joint force commander to integrate UAVs into the planning, preparing, conducting, and sustaining of joint forces to accomplish operational or strategic objectives through the conduct of campaigns and major operations.			
16. Distribution / Availability of Abstract:	Unclassified X	Same As Rpt	DTIC Users
17. Abstract Security Classification: UNCLASSIFIED			
18. Name of Responsible Individual: CHAIRMAN, JOINT MILITARY OPERATIONS DEPARTMENT			
19. Telephone: 841-6461		20. Office Symbol: C	

INTRODUCTION

Operational art can be defined as that component of military art "concerned with both theory and practice of planning, preparing, conducting, and sustaining one's own and friendly forces to accomplish operational or strategic objectives in a given theater through the conduct of campaigns and major operations."¹ For the joint force commander (JFC), his focus is on sequencing and synchronizing the efforts of his assigned joint forces to produce the maximum relative combat power at the decisive time and place. The role of joint doctrine in this endeavor is to serve as the foundation to guide the employment of joint forces and provide a basis for joint training to enhance the effectiveness of joint operations. In this regard, joint doctrine for unmanned aerial vehicles (UAVs)² does not fulfill its obligation to enhance the effectiveness of joint operations. Joint doctrine for UAV employment considers UAVs as tactical assets and in so doing, undermines their ability to conduct operations at the operational and strategic levels of war. This myopic focus inhibits the integration of UAVs into sequenced and synchronized joint operations, thereby, limiting their ability to enhance the effectiveness of joint operations. This paper will demonstrate that **UAVs are more than a tactical asset and doctrine must be changed in order for commanders to realize the full potential of UAVs to enhance joint operations.** However, before integrating UAVs into joint operations the basic question of why the joint force commander should be concerned with their employment must first be answered. The answer to this question is quite simple. UAVs are a viable weapon system and are slated to have an ever-growing presence in our weapon arsenal.

A VIABLE WEAPON SYSTEM

The U.S. experience with UAVs dates back to the Korean War and the Vietnam War. However, it wasn't until 1982 that their usefulness as a force multiplier became apparent on a global basis. In that year, during the Operation Peace for Galilee campaign, the Israelis used UAVs in concert with their manned assets to decimate the Syrian integrated air defense system (IADS). Months before the attack, the Israelis used their UAVs to probe and fingerprint the electronic frequencies of the Syrian surface to air missile (SAM) and anti aircraft artillery (AAA) radars to determine the electronic order of battle (EOB)³ of the Syrian IADS.

During the actual attack on 9 June 1982, a textbook example of modern day electronic warfare, the UAVs were the lead element of a sequenced and synchronized effort of Israeli land and air forces to gain air superiority over the Bekaa Valley. UAVs were first flown over the battlefield emitting dummy signals of Israeli fighters to confuse the SAM tracking radars into thinking real aircraft were attacking. The Syrians responded by tracking and expending their missiles against the UAVs which then set the stage for the other Israeli assets to systematically engage and eliminate the Syrian IADS in set-piece fashion.⁴ UAVs also played a key role during the actual air-to-air phase of the operation. The Israelis positioned UAVs over airfields deep within Syrian territory to gather data on how many aircraft were taking off from Syrian airfields. This data was relayed to the E-2C Hawkeye aircraft which then vectored Israeli Air Force (IAF) fighters to engage and destroy the targets. The cumulative results of this sequenced and synchronized effort was

the destruction of over ninety Syrian aircraft and 17 Syrian SAM batteries without the loss of a single Israeli aircraft.⁵

U.S. DEVELOPMENT

The new significance and value of UAVs to military operations was lost on the U.S. military until the arrival of the Persian Gulf War. Prior U.S. military operations in Grenada, Operation Urgent Fury, and Libya, Operation Eldorado Canyon, did generate the request for an inexpensive system to provide over-the-horizon (OTH) targeting, reconnaissance and battle damage assessment (BDA) for commanders. However, only the Marines took action and responded with the Pioneer UAV as a nondevelopmental item to support Marine Corps operations.⁶ The arrival of Desert Shield and Desert Storm, with an accompanied shortage of tactical reconnaissance assets, found battlefield commanders with little or no reconnaissance, surveillance and target acquisition (RSTA) or BDA assets. To fill this void, tactical commanders turned to the Pioneer UAVs. Six Pioneer systems (three with the Marine Corps, two with the Navy, and one with the Army) were deployed during the Gulf War to fly over 523 sorties and log over 1500 flight hours.⁷ The Pioneers quickly proved their worth in combat and revalidated the effectiveness of UAVs as combat force multipliers in varied military operations. Army AH-64 Apache helicopter pilots used them to conduct route reconnaissance, Navy gunners on the battleship *U.S.S Wisconsin* and *U.S.S Missouri* used Pioneers to spot every 16-inch round fired for naval gunfire support, and the commander of the Marine Air Ground Task Force also relied on them to monitor the Iraqis' reaction to Marine armor, artillery and troop movements.⁸

Based on their performance on the battlefield and endless requests from tactical commanders, the Department of Defense and Congress acknowledged the viability of UAV as a weapon system. This resulted in the commitment of a significant portion of the Defense Airborne Reconnaissance Office (DARO)⁹ budget toward funding and fielding UAV systems that may one day replace some manned aircrafts.¹⁰ The high level of commitment is reflected in DARO's newly released funding projection, where the UAV's share of DARO's funding indicates an increase from 21% for FY 96/FY 97 to 23% for 1998 -2003.¹¹ With this level of commitment to field new systems, UAVs will represent a significant portion of the operational commander's assets in the near future.

AN ASSET TO THE OPERATIONAL COMMANDER

Despite the predominant employment of UAVs during the Persian Gulf War as an asset for the tactical commander, UAVs can also serve to benefit the entire joint task force by performing some of the functions of operational art. These functions "allow the operational commander the wherewithal to plan, prepare, conduct and sustain military actions across the full range of military operations."¹² The Israelis' use of UAVs to build the EOB for the Syrian IADS is a clear example of how an operational function, operational fires, helped them to obtain and maintain their freedom of action. Operational fires may be *lethal* or *nonlethal* and allow the JFC to leverage his assets by striking directly at the enemy's operational depth. Fires are meant to help shape the battlefield and, when used effectively, can have a decisive impact on the conduct of major operations or campaigns by:

- Facilitating friendly operational maneuver
- Disrupting maneuver of enemy forces
- Isolating the theater of area of operations
- Preventing the arrival of enemy forces in the area of operations
- Neutralizing the enemy's operational reserve
- Deceiving the enemy as to the main point of attack¹³

Lethal fires are designed to delay, disrupt, destroy or degrade enemy forces, or critical functions and facilities through the employment of weapons on targets.¹⁴ *Nonlethal* fires are intended to impair, disrupt or delay enemy forces, functions and facilities through the employment of nonlethal assets such as electronic warfare.¹⁵

In the *nonlethal* role, electronic warfare (EW) is one of the key tools of operational fires. The Israelis successfully used this tool to determine the location and frequencies of the Syrian SAM and AAA systems. The frequency information was used to program the Israeli anti-radiation missiles while the location allowed the IAF and ground units to synchronize their attacks to neutralize the Syrian air umbrella. Without this umbrella, Israeli ground forces were able to undertake a rapid assault to strike at their objective, the Bekaa Valley¹⁶, while the Syrian ground forces were exposed and at the mercy of Israeli aircrafts. The overriding success of the air war, through the sequencing and synchronization of land and air assets, allowed the Israelis to maintain their freedom of action while simultaneously restricting the Syrians' use of space.

POLITICAL OBJECTIVE

The utility of using UAVs to achieve operational and strategic objectives was lost on the U.S. military. In December, 1983 the U.S. Navy elected to use manned aircraft to

conduct a raid* in response to Syrian AAA and SAM launches against F-14 tactical aerial reconnaissance pods system (TARPS) sorties. UAVs could have served the operational commander during this crisis in two ways. First, if a UAV was used to perform TARPS mission, chances of it being engaged would have been small since one of the greatest advantages of a UAV is its "inherent low visibility to radar, acoustic, and infrared sensors."¹⁷ Once the decision was made to attack the Syrian AAA sites, in retaliation for their attacks against the TARPS aircraft, the use of the battleship U.S.S. *New Jersey's* 16-inch guns was dismissed. This decision was based on the *political desire* to minimize collateral damage and the inaccuracy of naval gunfire without forward spotters to adjust the artillery fire.¹⁸ Without reliable "eyes on target" to adjust the gunfire and thereby minimize collateral damage, the only choice left to the operational commander and the Chief of Naval Operations was to risk the lives of aircrews from the carriers U.S.S. *Kennedy* and U.S.S. *Independence*. Second, UAVs could have served the operational commander again in this crisis by providing the eyes on target for the naval gunners, thereby minimizing the collateral damage to achieve the stated political objectives of the attacks without risking fliers lives. In addition to the fatality and loss of aircraft, Lt. Robert O. Goodman was captured and released a month later after his A-6E was shot down.¹⁹ Ironically during this attack the United States lost more airplanes than the Israelis did during their attacks against these same AAA positions just one year earlier.²⁰

* A raid is usually a small-scale operation usually conducted to achieve a tactical objective. However, it may have either strategic or tactical significance. The deciding factor is the role politics plays in executing the raid. Clearly from the prominence of the National Command Authorities in executing this raid, it had a strategic significance.

OPERATIONAL FUNCTIONS

UAVs can perform a multitude of other operational functions for the operational commander to include: operational protection, operational intelligence, and command and control warfare (C2W), as part of command and control (C2). However, UAVs may pay the biggest dividends to operational commanders and the joint force when they conduct missions in support of those operations classified as military operations other than war (MOOTW). The overriding concern of the public, our political leaders, and hence operational commanders whenever U.S. forces are deployed is the desire to keep U. S. casualties low. This sentiment was evident during the build-up of Desert Shield and played a major role in shaping our scheme of maneuver during the execution of Desert Storm. However, this concern takes on an added meaning when U.S. forces are deployed to support MOOTW scenarios such as Operation Restore Hope (Somalia) and Operation Joint Endeavor (Bosnia).

CENTER OF GRAVITY

The response to casualties in MOOTW scenarios appears to be more damaging because in general these scenarios are not viewed to represent U.S. vital interest. Therefore, the "*will of the people*" to support these types of operations has often been identified as the U.S. "*strategic center of gravity*." With this in mind, the single loss of life of a U.S. or other coalition member can significantly affect the outcome of the mission. This misfortune almost occurred during Operation Joint Endeavor, when the capture of a downed French Mirage pilot almost caused a complete breakdown of the Dayton peace agreement.²¹ The U.S. response to the shootdown of Capt Scott O'Grady over the skies of

Bosnia and the killing of U.S. military personnel on the streets of Mogadishu further reaffirms this point. The ability of UAVs to lower the political risk during these types of operations is evidenced by the fact that most Americans are unaware that two Predator UAVs were lost over the skies of Bosnia in August 1995.²² This is in sharp contrast to the response following the shootdown of Capt O'Grady's F-16 a few months earlier.²³

ENGAGEMENT

As the leader of the free world, the United States will continue to engage in politically dicey MOOTW scenarios to promote peace and stability. UAVs will allow the operational commander to perform his reconnaissance sorties under hostile conditions and maintain a vigil watch on the situation without needlessly risking the lives of military personnel. In this regard, UAVs may best serve the operational and strategic commanders by keeping manned assets out of harms way to lower the probability of casualties, thereby, protecting the *"strategic center of gravity."* Somehow, parading a piece of twisted metal from a "captured" UAV for the world media does not exert the same level of political pressure or embarrassment as a captured pilot. Moreover, UAVs will never confess to the illegitimacy of an operation or sign statements that are potentially politically damaging to the United States.

Given this range of benefits and advantages to the operational commander, what is it that has limited or can limit the employment of UAVs to benefit the operational commander and the joint force as a whole? The answer lies in joint doctrine whose role is to "fundamentally shape the way we plan, think, and train for military operations."²⁴

JOINT DOCTRINE AND EMPLOYMENT OF UAVS

Joint doctrine establishes the foundation of our ability as a joint team to fight and win the Nation's wars. Commanders must understand and apply joint doctrine as they prepare, train and lead the men and women of America's Armed Forces.²⁵

The stated purpose of Joint Publication 3-55, "Doctrine for Reconnaissance, Surveillance, and Target Acquisition" (RSTA) and 3-55.1 "Joint Tactics, Techniques, and Procedures (JTTP) for Unmanned Aerial Vehicles" is to provide military guidance for the exercise of authority by joint force commanders and prescribe doctrine and tactics, techniques and procedures for operations and training.²⁶ Nevertheless, in the actual development of this guidance and doctrine, both joint publications describe the employment of UAVs only in a tactical context. Joint Pub 3-55.1 states "The primary mission of UAV units is to support their respective Service component commands as a *tactical* [emphasis added] reconnaissance, surveillance, and target acquisition (RSTA) system providing the commander a capability to gather near-real-time data on opposing force position, composition, and state of readiness."²⁷ Equally discerning is the UAV reference from JP 3-55 which states "Medium-range UAVs (MR-UAV) will serve as a *tactical* [emphasis added] reconnaissance platforms which will have a range on the order of 650 km but will have an on station endurance of only two hours."²⁸ In addition, Joint Publication 2-0, Intelligence Support to Joint Operations, echoes this tactical focus by stating "UAV...is an unique collection system designed to provide commanders with near real-time tactical intelligence."²⁹ JP 3-55 and JP 2-0 defers "detailed discussion of UAVs" to JP 3-55.1.

As the *de facto* doctrinal guidance for UAV employment, JP 3-55.1 does not fulfill its obligation as joint doctrine. "Joint doctrine must articulate the process required for successful joint planning but must be flexible enough to serve as a broad framework to guide forces in joint operations. It is the key to enhanced jointness because it transforms technology, new ideas, and operational concepts into joint capabilities."³⁰ Doctrine is also the bridge between the theoretical and practical aspects of operational art. From the definition of operational art, "...that component of military art concerned with both theory and practice of planning, ..." ³¹ it is readily apparent that there are theoretical and practical aspects to the application of operational art. The role of doctrine in the application of operational art is to take what is taught in theory and transform it into principles and capabilities that the commander can then put into practice. In this role, joint doctrine must guide the employment of joint forces and provide a basis for joint training to enhance the combat effectiveness of our joint forces.

UAV CATEGORIES

Previously, one of the main factors framing this tactical focus of UAV doctrine was the limited range and payload of fielded UAV systems. These joint publications were developed when the only fielded system was the Pioneer system that "pioneered" UAVs acceptance in the U.S. military. The practice of classifying UAVs (tactical, operational, or strategic) according to their individual characteristics continues today and is reflected in the development of UAVs to serve different echelons of commanders: The Hunter and Outrider UAVs for tactical commanders, the Predator for operational commanders, and the Darkstar and Global Hawk for operational/strategic commanders.³²

The development of specific classes of UAVs to serve the different echelons of commanders does not enhance the combat effectiveness of our joint forces. On the contrary, it promotes the perception that they are only useful for certain designated functions and roles. The designation of a weapon system should not be based on its characteristic but on its utilization. It is the utilization of assets that should determine their classification. To accept the reverse, limits the exploitation of their inherent qualities to develop new operational concepts. The artificiality of the class designation does not provide for "thinking outside the box" and should not be the basis for doctrinal guidance.

COMPLEMENTARY MISSION

The focus on the tactical, operational or strategic nature of UAVs does not adequately indicate their ability. As an illustration, Global Hawk is intended to be the backbone of the long-range UAV fleet with a projected radius of 3,000 nautical miles.³³ This operational/strategic level UAV can support different Services and levels of commanders during the same mission. For a hypothetical task force sailing to perform Amphibious operations against an island or an enemy in a littoral, Global Hawk can:

- Transit the ocean in advance to scout for enemy surface forces (supporting the Navy)
- Survey the designated beachhead for any last minute enemy reinforcements or obstacles on the proposed landing site (supporting the Marines)
- Collect on the enemy's EOB to determine the location of the enemy's IADS assets (supporting land and naval air forces)
- Fix the location of major elements of the enemy's land forces and points of concentration (supporting the Army)
- Provide an assessment of relative combat strength and preparedness of the enemy's defenses (assist operational commander in his decision to commit operational reserves)

In another theoretical example, several “tactical” assets could be organized by the JFC to provide operational protection³⁴ for the force. Tactical UAVs, Pioneers, could be employed to perform the operational protection function by detecting theater ballistic missile (TBM) launches and cueing friendly theater missile defense (TMD)³⁵ assets such as Patriot or Theater High Altitude Area Defense (THAAD). This would lead me to conclude that *maximizing effectiveness in a joint operation means providing the operational commander and his staff with the framework (doctrine and training) to control and prioritize the application of all available assets to achieve the operational and strategic objective. The absence of this framework inhibits the operational training of the operational commander and his staff as well as the development of new concepts of operation.*

IMPLICATIONS FOR THE OPERATIONAL COMMANDER

Joint Publication 3-55.1 does establish that certain aspects of UAV employment requires *coordination* at the operational level. It states that UAV missions should be coordinated with the airspace control authority (ACA), area air defense commander (AADC) and the joint force air component commander (JFACC) to provide safe separation of UAVs and manned systems and to prevent engagement by friendly air defense systems. In addition, it does call for the inclusion of preplanned UAV flights in support of the JFC or another Service in the air tasking order (ATO) special instructions (SPINS) and airspace control order (ACO)³⁶. This acknowledgment is encouraging. However, coordination by itself does not establish the appropriate framework that is required to effectively plan,

prepare and conduct sequenced and synchronized operations to benefit the joint force as a whole; nor does it provide a basis for joint training.³⁷

TRAINING

Joint and operational training addresses the "planning and preparing" aspects of operational art. In particular, operational training is aimed at preparing commanders and their staffs to plan, prepare, and conduct major operations and campaigns. The most practical means of achieving this is through joint and combined large-scale exercises and maneuvers that closely simulate strategic or operational objectives in a theater. Moreover, "large scale exercises provide an opportunity to synchronize maneuver and support forces in realistic, stressful situations. Short of combat, exercises are the best method to determine training and readiness strengths and weaknesses."³⁸ This has the obvious advantage of allowing the operational commander and his staff to anticipate and prepare appropriate courses of action (COA) in response to a potential crisis which can eventually be incorporated into operational plans (OPLANS) and conceptual plans (CONPLANS). Therefore, to arrive at the best COA, the operational commander and his staff must consider *all* capabilities of both friendly and enemy forces. The value of operational training is not necessarily the actual plans that are developed but the experience gained by preparing them. The practical value of operational training through advance planning and exercises is reflected in its impact on the conduct of the Persian Gulf War:

In the fall of 1989, the Department shifted the focus of planning efforts in Southwest Asia to countering regional threats to the Arabian peninsula. The primary such threat was Iraq. As a result, CENTCOM prepared a Concept Outline Plan for addressing the Iraqi threat in the Spring of 1990. The outline plan contained both the overall forces and strategy for a successful defense of the Gulf states. This plan was developed into a draft operations plan by July 1990. In conjunction with the development of the plan, General Schwarzkopf had arranged to conduct an exercise, INTERNAL LOOK 90, which began in July. The exercise tested aspects of the plan for defense of the Arabian peninsula. When the decision was made to deploy forces in response to King Fahd's invitation, this plan was selected as the best option. It gave CENTCOM a head start.³⁹

Joint Publication 3-55.1 does authorize the JFC to direct UAV assets for the overall support of the joint force.⁴⁰ However, to do so on an *ad hoc* basis without planning for and integrating them into his scheme of maneuver is not “jointness” or an application of operational art. Before the JFC can successfully integrate UAVs into his campaign and major operations, he must first be versed in the “planning” and “preparing” aspects of operational art. This prerequisite can only be achieved when joint doctrine establishes a foundation for the employment and training of joint forces.

RECOMMENDATIONS

1. JTTP for UAVs should be the one stop shopping for UAV employment.

Therefore, other joint publications that can benefit from UAVs should reference the JTTP for UAVs. These include JP 3-07, JP 3-13, JP 3-51, and JP 3-01
2. Current JTTP for UAVs is for nonlethal UAVs. Proposal exists for lethal UAVs to take active role in TMD. Therefore, either create lethal application section in current joint publication or establish new one to specifically address lethal UAVs
3. Control of UAVs must be addressed in JTTP for UAVs. Only coordination is addressed in JP 3-55.1 and 3-52. The question of "control" must be addressed before the next conflict. The JFC and Services must know if UAVs will be under the Joint Force Air Component Commander (JFACC)
4. JTTP for UAVs should not classify UAVs as tactical, operational or strategic. Instead, should use close, short, medium or endurance categories
5. JP 3-55.1 is currently listed as a sub-document to JP 3-55 RSTA. Recommend renumbering JTTP for UAVs to recognize present and future non-RSTA combat support applications

CONCLUSION

UAVs have demonstrated their tactical utility through their brilliant performance during past conflicts. However, they have not fully realized their potential to conduct operations at the operational and strategic levels of war. UAVs can perform many of the functions of operational art that allow the JFC to produce the maximum relative combat power at the decisive time and place. These functions include operational fires, operational intelligence, and operational protection. To serve the joint force commander, UAVs must be integrated into his scheme of maneuver and not employed on an *ad hoc* basis. The key to a seamless integration of UAVs is a joint doctrine to guide their employment and provide a basis for joint training.

Current joint doctrine considers UAVs as tactical assets and does not establish an appropriate framework to employ them at the operational level. The existence of Pioneer as the only fielded UAV system may be the basis for the tactical focus of joint doctrine. However, as we look into the future and see the development of specific classes of UAVs for the operational and strategic commanders, it is readily apparent that it is not just the existence of new technology or a new weapon on the battlefield that can provide distinct military advantages. It also takes *doctrinal developments* to weave *technological advancements* into the operational fabric of the military. Only then can an adequate framework for employment and training be established to allow a joint force commander to engage in the practice “of planning, preparing, conducting, and sustaining the joint forces to accomplish operational or strategic objectives through the conduct of campaigns and major operations.”⁴¹

ENDNOTES

¹ Milan Vego, "Operational Art," An Unpublished Paper. U.S. Naval War College, Newport, RI: 1996. Page 6.

² For this paper, UAVs are defined as stated in Joint Publication 1-02, DOD Dictionary of Military and Associated Terms. - A powered, aerial vehicle that does not carry a human operator, uses aerodynamic forces to provide vehicle lift, can fly autonomously or be piloted remotely, can be expendable or recoverable, and can carry a lethal or nonlethal payload. Ballistic or semiballistic vehicles, cruise missiles, and artillery projectiles are not considered unmanned aerial vehicles.

³ An EOB is derived from electronics intelligence analysis. It provides the number, system type, location, and various other aspects of a designated force's equipment status. U.S. Department of the Air Force, Air Force Manual 2-8, Electronic Combat (EC) Operations, 39.

⁴ Richard A. Gabriel, Operation Peace For Galilee: The Israeli-PLO War in Lebanon, New York: Hill and Wang, 1984, 98.

⁵ Ibid., 98-99.

⁶ "UAV Annual Report." Executive overview of the Defense Department's unmanned aerial vehicle (UAV) Program Activities for 1994-1995. August 1995 <<http://www.acq.osd.mil/daro/uav/uav.html> > (21 Nov 96), 1.

⁷ Don Flamm, "Unmanned Aerial Vehicles, Now War-Proven, Come of Age," Asian Defence Journal, August 1991, 20.

⁸ "Gulf War Experience Sparks Review of RPV Priorities," Aviation Week and Space Technology, April 22, 1991, 86.

⁹ DARO was established on 6 November 1993 by the Deputy Secretary of Defense to unify existing airborne reconnaissance architectures and enhance the management and acquisition of manned and unmanned airborne assets. The DARO was tasked to assess the airborne reconnaissance needs of the U.S. through 2010 and develop and implement the strategy to meet those needs in a timely and cost effective manner. Defense Airborne Reconnaissance Office (DARO), Integrated Airborne Reconnaissance. 23 March 1995, <<http://www.acq.osd.mil/daro/homepage/daro1.html>> 15 November 1996.

¹⁰ Peter Grier, "Darkstar and His Friends," Air Force Magazine, July 1996, 40-41.

¹¹ 1995 UAV Annual Report, 4 and "U.S. Readies UAVs for New Battlefield Roles," Defense News, January 13-19 1997, 4.

¹² Naval War Collge JMO Department, "Operational Functions," An Unpublished Paper. U.S. Naval War College, Newport, RI: 1996, 1.

¹³ Ibid., 27 (Not all inclusive)

¹⁴ Ibid., 25.

¹⁵ Ibid., 25.

¹⁶ Gabriel, 100.

¹⁷ David Fulghum, "Tier 2 Endurance UAV Nears First Flight," Aviation Week and Space Technology, May 16 1994, 20.

¹⁸ George C. Wilson, Supercarrier: An Inside Account of Life Aboard the World's Most Powerful Ship, the USS John F. Kennedy, (New York: Macmillan, 1986), 127.

¹⁹ Brian T. Tice, "Unmanned Aerial Vehicles: The Force Multiplier of the 1990's," Airpower Journal, Spring 1991, 43.

²⁰ Steven M. Shaker and Alan R. Wise, War Without Men: Roots on the Future Battlefield, vol. 2, (Washington: Pergamon-Brassey's, 1988), 100.

²¹ John Shanahan, "No-Fly Zone Operations: Tactical Success, Strategic Failure, and the Missing Link," Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1996, 15.

²² John M. Deutch, Under Secretary of Defense (Acquisition and Technology), Long Endurance Support for the Joint Force Commander, July 1993, <<http://www.acq.osd.mil/acqweb/navigatr.html>>, 20 November 1996.

²³ Capt O'Grady was performing a combat air patrol mission (CAP) while the UAVs were performing a RSTA mission. The purpose of the comparison is to show that when the human is removed from these incidents the political risk is significantly lowered.

²⁴ U. S. Joint Chiefs of Staff, Joint Vision 2010, p. 30.

²⁵ John m. Shalikashvili, Chairman of the Joint Chiefs of Staff, <<http://www.dtic.mil/doctrine/>> 20 January 1997.

²⁶ U. S. Joint Chiefs of Staff, Joint Pub 3-55: Doctrine for Reconnaissance, Surveillance and Target Acquisition Support for Joint Operations, April 1993, p. iv. (henceforth cited as Joint Pub 3-55) and U. S. Joint Chiefs of Staff, Joint Pub 3-55.1: Joint Tactical Techniques, and Procedures for Unmanned Aerial Vehicles, August 1993, iii. (henceforth cited as Joint Pub 3-55.1)

²⁷ Joint Pub 3-55.1, II-1.

²⁸ Ibid., II-4.

²⁹ U. S. Joint Chiefs of Staff, Joint Pub 2-0: Joint Doctrine for Intelligence Support to Operations, May 1995, VI-17.

³⁰ Joint Vision 2010, 29.

³¹ "Operational Art" 6.

³² Ronald Wilson, "Eyes in the Sky," Military Intelligence, July 1 1996. 16.

³³ Grier, 44.

³⁴ Protecting one's own and friendly forces from a wide range of threats is one of the commander's most important responsibilities. It is aimed at preserving the combat effectiveness of one's own and friendly forces and assets deployed within a given theater of operations, so that they can be employed at the decisive time and place. "Operational Functions," 32.

³⁵ TMD is one of the key elements of operational protection. The primary aim is to protect population centers, military and economic assets, and mobile forces. Effective TMD not only has "operational" importance but can be one of the key elements of regional stability. "Operational Functions," 34.

³⁶ Joint Pub 3-55.1, II-5.

³⁷ U. S. Joint Chiefs of Staff, Change 1, Joint Pub 1-01, Joint Publications System, Joint Doctrine and Joint Tactics, Techniques, and Procedures Development Program, September 1993, I-1.

³⁸ U. S. Department of Defense, Final Report to Congress - Conduct of the Persian Gulf War, (Washington DC: 1992), 356.

³⁹ Ibid., xxvii.

⁴⁰ Joint Pub 3-55.1, II-4.

⁴¹ "Operational Art" 6.

BIBLIOGRAPHY

- Advisory Group for Aerospace Research & Development. "Future use of Unmanned Aerospace Vehicles in the Maritime Environment." Aerospace Applications Study 36, North Atlantic Treaty Organization, 1994.
- Davis, Jeffery P. and Damien X. Lott. "UAV Company: Should it be a VMO Squadron." Marine Corp Gazette, October 1994: 38-40.
- Defense Airborne Reconnaissance Office. "Unmanned Aerial Vehicles Program Plan." Department of Defense: Washington DC, April 1994.
- Deutch John M. Under Secretary of Defense (Acquisition and Technology), Long Endurance Support for the Joint Force Commander, July 1993, <<http://www.acq.osd.mil/acqweb/navigatr.html>>, 20 November 1996.
- Fitzsimonds, James R. and Jan M. Van Tol, "Revolutions in Military Affairs," Joint Force Quarterly, Spring 1994, 24-31.
- Flamm, Don. "Unmanned Aerial Vehicles, Now War-Proven, Come of Age." Asian Defence Journal. August 1991: 20+.
- Fulghum, David A. "CIA to Deploy UAVs in Albania." Aviation Week & Space Technology, 31 January 1994: 20-21.
- Fulghum, David A. "CIA to Fly Missions From Inside Croatia." Aviation Week & Space Technology, 11 April 1994: 20-21.
- Fulghum, David A. "DARO Pushes Endurance UAVs." Aviation Week & Space Technology, 11 April 1994: 23-24.
- Fulghum, David A. "Electronic Combat UAVs Gain Support." Aviation Week & Space Technology, 11 September 1995: 56-58.
- Fulghum, David A. "Outrider UAV Tackles Army, Navy Requirements." Aviation Week & Space Technology, 22 July 1996: 70-72.
- Fulghum, David A. "Unmanned 'Spies' to Tune in Bosnia." Aviation Week & Space Technology, 29 April 1994: 58-59.
- Fulghum, David. "Tier 2 Endurance UAV Nears First Flight." Aviation Week and Space Technology, 16 May 1994, 20-21.

- Gabriel, Richard A. Operation Peace for Galilee: The Israeli-PLO War in Lebanon. New York: Hill and Wang, 1984.
- Grier, Peter. "Darkstar and His Friends." Air Force Magazine, July 1996, 40-44.
- Karch, Lawrence G. "Very Low Cost UAVs: Why We Need Them, What More We Need To Do." Marine Corps Gazette, 54-57.
- "Gulf War Experience Sparks Review of RPV Priorities," Aviation Week and Space Technology, 22 April 1991, 86-87.
- Knowles, John. "EW and UAVs: Payloads That Pay Off." Journal of Electronic Defense, July 1996. 35-43.
- Lambeth, Benjamin S, Moscow's Lessons from the 1982 Lebanon Air War. RAND, September, 1984.
- Millis, Philip J. "RPVs over the Bekaa Valley: A Lesson from War in Lebanon." ARMY, June 1983, 49-51.
- Odell, Robert. "Analysis of Joint Force Air Component Commander and Joint Targeting in Exercise Ocean Venture 93." An Unpublished Paper, Center for Naval Analysis, Alexandria: June 1995.
- "Operational Functions." An Unpublished Paper, U.S. Naval War College, Newport, RI: 1996.
- "Persian Gulf Shows Off UAVs." Armed Forces Journal International, July 1991. 32-34.
- "Predator, Darkstar and Other Cult Classics." The Economist, 17 June 1995: 81-82.
- Shaker, Steven M, and Alan R. Wise. War Without Men: Robots on the Future Battlefield. Washington: Pergamon-Brassey's, 1988.
- Shalikashvili John M., Chairman of the Joint Chiefs of Staff, <<http://www.dtic.mil/doctrine/>> 20 January, 1997.
- Shanahan, John N. T. "No-Fly Zone Operations: Tactical Success, Strategic Failure, and the Missing Link," Unpublished Research Paper. U.S. Naval War College, Newport, RI: 1996.
- "The Expanding Role of Unmanned Aerial Vehicles." ARMY, September 1995, 55-57.
- Tice, Brian T. "Unmanned Aerial Vehicles: The Force Multiplier of the 1990's." Airpower Journal, Spring 1991, 41-55.

- "UAV Annual Report." Executive overview of the Defense Department's Unmanned Aerial Vehicle (UAV) Program Activities for 1994-1995. August 1995
<<http://www.acq.osd.mil/daro/uav/uav.html>> (21 Nov 96)
- U. S. Department of Defense, Final Report to Congress - Conduct of the Persian Gulf War
Washington DC: 1992.
- U. S. Joint Chiefs of Staff, Change 1, Joint Pub 1-01, Joint Publications System, Joint Doctrine and Joint Tactics, Techniques, and Procedures Development Program.
Washington DC: September 1993.
- U. S. Joint Chiefs of Staff, Joint Vision 2010. Washington DC.
- U.S. Department of the Air Force, Air Force Manual 1-1 Volume II: Basic Aerospace Doctrine of the United States Air Force. Washington DC: March 1992.
- U.S. Department of the Air Force, Air Force Manual 2-8, Electronic Combat (EC) Operations. 30 June 1987.
- U.S. Department of the Air Force, JFACC Primer, Washington DC: 1992.
- U.S. Joint Chief of Staff. Joint Publication 3-13.1, Joint Doctrine for Command and Control Warfare (C2W). Washington DC: 7 February 1996.
- U.S. Joint Chief of Staff. Joint Publication 3-52, Doctrine for Joint Airspace Control in the Combat Zone. Washington DC: 22 July 1995.
- U.S. Joint Chiefs of Staff. Joint Publication 1-02, DOD Dictionary of Military and Associated Terms. Washington DC: 23 March 1994.
- U.S. Joint Chiefs of Staff. Joint Publication 2-0, Joint Intelligence Doctrine for Intelligence Support to Operations. Washington DC: May 1995.
- U.S. Joint Chiefs of Staff. Joint Publication 3-55, Doctrine for Reconnaissance, Surveillance, and Targeting Support for Joint Operations (RSTA). Washington DC: 14 April 1993.
- U.S. Joint Chiefs of Staff. Joint Publication 3-55.1, Joint Tactics, Techniques, and Procedures for Unmanned Aerial Vehicles (UAVs). Washington DC: 27 Aug 1993.
- U.S. Joint Chiefs of Staff. Joint Publication 3-56.1, Command and Control for Joint Air Operations. Washington DC: 14 Nov 1994.
- "U.S. Readies UAVs for New Battlefield Roles." Defense News, 13-19 January 1997, p. 4.

Vego, Milan, "Operational Art." An Unpublished Paper, U.S. Naval War College, Newport, RI: 1996.

Williams, Jason M. "Unmanned Aerial Vehicle Support for the Korean Theater." Marine Corp Gazette, October 1994, 36-37.

Wilson, George C. Supercarrier: An Inside Account of Life Aboard the World's Most Powerful Ship, the USS John F. Kennedy. New York: Macmillan, 1986.

Wilson, Ronald. "Eyes in the Sky." Military Intelligence, 1 July 1996. 16+.